TRANSLATION FROM GERMAN

(12) WORLD ORGANIZATION OF INTELLECTUAL PROPERTY
INTERNATIONAL APPLICATION PUBLISHED PURSUANT TO THE PATENT COOPERATION TREATY (PCT)

(19) World Organization for Intellectual Property
International Office

(43) International Publication Date: 24 October 2002

PCT

(10) International Publication Number: **WO 02/083037 A1**

(51) International Patent Classification[7]: **A61 F 2/06**

(21) International Application Number: PCT/DE02/01244

(22) International filing date: 5 April 2002

(25) Filing language: German

(26) Publication language: German

(30) Priority data:

101 18 944.3 18 April 2001 GERMANY

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(81) Designated nations *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

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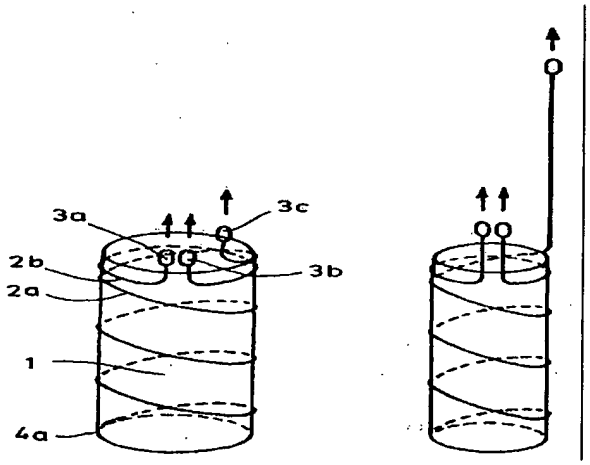
(54) Title: REMOVABLE, ESSENTIALLY CYLINDRICAL IMPLANTS

(57) Abstract: The invention relates to removable, essentially cylindrical implants that are characterized in that they can be reduced in diameter and that one or more elastic, thin wire structures (2a, 2b) that has/have a catch element (3a, 3b) at least on one end thereof are singly or multiply wound around them at one or more levels.



(84) Designated nation *(regional)*: ARIPO Patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian Patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM); European Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR); OAPI Patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

– *with International Search Report*

– *before expiration of the deadline for amendments to claims; republished, if amendments are submitted*

For explanation of the two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" at the beginning of each regular issue of the PCT Gazette.

REMOVABLE, ESSENTIALLY CYLINDRICAL IMPLANTS

The invention concerns removable, essentially cylindrical implants.

Such implants, for the most part so-called stents, must occasionally be removed again from the body for a variety of reasons after surgical intervention, which, in many cases, is not without problems, since newly formed tissue grows onto and, depending on its structure, also grows through the implants, and therefore removal can produce complications.

Consequently, there is still a requirement for configuring such cylindrical implants, so that they can be removed again from the body without particular demands and as free of complications as possible.

Removable, cylindrical implants, especially stents, according to the main claim are proposed to solve this task.

It surprisingly turned out that the previous difficulties during removal of the corresponding implants can be eliminated in relatively simple fashion, if these implants are reducible in diameter and are wound by one or more thin elastic wire-like structures, hereafter referred to as wire in the interest of simplicity, and this wire has a catch device on at least one end, in which it can be engaged with an appropriate surgical instrument or can be enclosed by such an instrument. By pulling on the catch device, the diameter of the implant is reduced by the wire at one or more levels of the overall implant, so that the implant can be released from the tissue or vessel walls and pulled out.

The implants usable according to the invention, i.e., especially stents, consist of a grid-like or mesh-like physiologically compatible metal or plastic and are often provided, at least on one side, with an open groove, so that this can be compressed subsequently, but otherwise can be pulled apart and are therefore reducible in diameter in each case. This is achieved according to the invention in that one or more wires made of metal or plastic, which are thin and elastic, are wound around the implant at least one height and generally are fastened on one end of the

implant, because of the increased safety, for example, with ordinary fastening techniques, like welding, looping, nodding or in similar fashion. However, it is also possible in certain cases to dispense with such fastening, if the wire encloses the implant repeatedly at one height and therefore cannot slide off. At least one end of the wire or wires is provided with a catch device, which can be designed as a thickened end to be grasped with a surgical instrument or as an eye or loop for engagement with an appropriate surgical instrument.

In a preferred variant, the implant, however, is wound by at least two wires that are wound in spiral fashion around the implant, and in which both free, i.e., unfastened, ends have a corresponding catch device.

In each case, it is essential that the catch device be already provided in the design of the implant, i.e., that a loop need not be made later around the implant, but that this be already provided or incorporated in production of the implant. The wire can run freely around the implant, especially during multiple windings, or can run in guide eyelets, which are arranged on the outside, inside or in the wall of the implant. The wire can also optionally run between the mesh or grid of the implant and an outer covering. If the loops are applied on the outside, this means that the implant is compressed or held together, especially when a groove is provided in the implant. If the pull wire is arranged on the inside, it pulls the stent together. In each case, it is decisive that the axial diameter is reduced by longitudinal tension, so that the implant can be carefully loosened from the tissue.

The wire design can extend over the entire length of the stent or only on the upper end. Optionally, the wire design can also run through the lumen of the stent, for example, crosswise.

In metal implants or during the use of metal wires, the design is perfectly configured, so that it can be recorded endoscopically, visually or under x-ray control without direct visual observation.

Because of the design according to the invention, removal of the cylindrical implant is significantly facilitated, since the time demands and complications are significantly lower.

The invention is further explained below with reference to the drawings:

Fig. 1 schematically depicts an implant according to the invention with a single loop on one end

Fig 2 schematically depicts an implant with a spiral loop as single loop

Fig. 3 schematically depicts an implant with a spiral loop as single loop and a simple loop on the end

Fig. 4 also schematically depicts an implant with spiral loops as double loops.

The implant 1 is wound in essentially a cylindrical form either on one end with a wire-like individual loop, which can be fastened either to the outer wall of the implant or winds around the implant several times. This wire-like loop 2a has a catch device 3a and 3b on each end, which at least partially leads to a reduction in diameter of the implant when pulled in the direction of the indicated arrows.

Instead of a single loop, the wire, as shown in Fig. 2, can also be designed as a spiral loop 2 that has a catch device 3a and is fastened to the implant on its end 4a, so that a reduction of the total diameter of the implant occurs during pulling in the indicated direction of the arrow.

As shown in Fig. 3, a spiral loop and a single loop can also be combined with each other, in which the implant 1, on the one hand, has a spiral loop 2a, which is fastened on end 4a, as well as a single loop 2b, on the other hand, in which both loops are provided with catch devices 3a, 3b and 3c. When pulled, a reduction of the total diameter therefore occurs, which is more strongly pronounced in the upper end of the additional single loop 2b than in the other part.

In a preferred variant, which is shown in Fig. 4, the implant 1 has two spiral loops 2a and 2b, which are fastened to the ends 4a and 4b of the implant and end in catch devices 3a and 3b. A particularly pronounced reduction in diameter of the implant can be achieved by the double spiral loop.

Claims

1. Removable, essentially cylindrical implants, characterized by the fact that they are reducible in diameter and are wound once or repeatedly at one or more levels by one or more elastic, thin, wire-like structures (2, 2b), having at least one catch device (3a, 3b) on one end.

2. Cylindrical implants according to Claim 1, characterized by the fact that the implant (1) consists of a grid or mesh of metal or plastic, provided with an open groove.

3. Cylindrical implants according to Claim 1 or 2, characterized by the fact that the wire-like structure or structures consist of metal or plastic.

4. Cylindrical implants according to Claims 1 to 3, characterized by the fact that one or more ends (4a, 4b) of the wire-like structure or structures (2a, 2b) is/are fastened on or in implant (1).

5. Cylindrical implants according to Claims 1 to 4, characterized by the fact that the catch device (3a, 3b) is designed as a thickened end, eye or loop.